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Remarks as prepared for
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Real-time Analytics and U.S. National Security
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Thank you for that kind introduction, Dawn [Scalici, Government Global Business Director, Thomson Reuters]. My thanks also to Don Upson [Co-Chairman, Government Business Executive Forum, conference organizer] for the opportunity to speak with everyone this morning. It's my privilege to be here.

The obvious question to start with is: "Why is the director of a U.S. intelligence agency is at the Consumer Electronics Show?" Followed by: "What does the National Geospatial-Intelligence Agency have to do with me?"

Well, you might be surprised to learn that many of us in this room are already partners. Everyone who produces or sells mobile phones, tablets, or car navigation systems, or builds location-based apps, uses NGA's products and services.

And, my big message to you this morning is that real-time analytics are vital to national security these days, and you may be able to play a role to help make more sense of the deluge of data out there, to make our nation and our way of life more secure, and our world a safer place.

So with that as my proposed value proposition, let me tell you a bit about my organization, the National Geospatial-Intelligence Agency, also known as "NGA" – the other National Gallery of Art, or National Governor's Association. NGA delivers world-class geospatial intelligence that provides a decisive advantage to policymakers, warfighters and intelligence professionals.

Despite an abundance of information and infinite opinions about what all that information means, there's still value in what we can uniquely collect, and the tradecraft that allows us to put information together in dispassionate, useful ways. Another way to state NGA's value proposition is that we provide the content and the context so the Nation can know the truth, see beyond the horizon, and be able to act before events dictate.

Yes, our mission includes analyzing data from government spy satellites; but it's so much more, because the world situation demands it, and our customers deserve it. It's about applying our tradecraft and advanced tools to evaluate imagery, maps, charts, multiple layers of data – such as terrain, elevation, and gravity – and the full spectrum of visible and invisible light. Our job is to understand what's happening and, where we can, why it's happening, anywhere on the planet, at all times – and to share our insight with mission partners, to pro-actively strengthen our nation's security, and to respond to natural and man-made disasters.
And believe it or not, we have a lot in common with you:

- We're in data-driven businesses.
- We're customer-centric.
- We have a shared interest in user experience design.
- We're attuned to competition – more than you might think. In fact, we welcome the company.
- And we must exist at the cutting edge of technology.

While the largest part of what we do is provide analytical support to national decision-makers and military commanders on foreign threats, my agency also helps create and support the infrastructure that supports the general public. It's an infrastructure that allows you to find the Jamba Juice nearest to your kid's soccer practice on the GPS device in your phone.

Speaking of games, we used to have a monopoly on all satellite imagery and mapping capabilities – Boardwalk and Park Place. It was a good life. That's not true anymore. In fact, it's not been true for some time.

We have to face reality. The Intelligence Community can't just stay in its own classified world anymore. It's not 1947 anymore, and the conditions under which we must ply our trade have changed. The world is faster, messier, noisier, and more connected. Any technology is broadly available to anyone.

The half-life of a secret is diminishing such that the overhead protection risks its utility. We spend so much time and energy protecting the how of what we do, vice protecting and projecting the relevancy of what we do.

Thus, I address you at CES – to elicit your interest, ideas, and, perhaps, your partnership, as we strive to transition our success in that closed system into the open. Or, as I'm fond of saying, we must succeed in the open.

Speaking of partnerships, fully 90% of our mapping, charting, and geodesy mission, and almost all of our humanitarian assistance missions, are dependent upon commercial satellite imagery. So, we've proven to ourselves that this messy, noisy, chaotic space can be formed into value for those that depend on us. Why? Because these days, that's where so much of the data, issues, technology, and people are. We know that.

We were the first intelligence agency to use GitHub, the first one to host our own web page, and the first to have apps at the iPhone App Store. One of those apps is to help avoid pirates out on the high seas. I'm assuming most of you won't ever need that one, but you never know.

And the recent historic vertical landing of SpaceX's Falcon 9 first stage was made possible, in part, by data developed by our agency.

In short: As an intelligence agency, we've had to get out of our comfort zone – that top secret world with top secret sources and top secret customers. Our profession has reinvented itself in the open, and thus we must learn to adapt and succeed in the increasingly expanding data environment.

So that's why I'm here: The director of an intelligence agency at the Consumer Electronics Show.

Now I'm going ask you to think outside your comfort zone, and consider working with us, to apply your innovative and remarkable technologies, and creatively support us in our mission. Let me explain to you a bit more what my agency does, so you see why this makes sense.

This is our vision ["Know the Earth … Show the Way … Understand the World"]. It greets you as you enter our headquarters, just outside Washington, D.C. It starts off with "Know the Earth," and we really have to know it. We're expert in the science of this planet, and that serves everyone well.

In addition to being an intelligence agency, NGA is a Combat Support Agency. Soldiers, sailors, airmen, Marines and Coast Guardsmen depend on NGA for all their maps, and nautical and aeronautical charts, which were traditionally paper, but – no surprise to a group like this – are now mostly digital. They don't train, transport, or fight without NGA. And given the import of their task, we provide assured access to those maps, 24 hours a day, seven days a week, everywhere around the globe, with no voids whatsoever.

They have to be pinpoint accurate – not just for navigation purposes, but for smart weapons to find their targets, and avoid collateral damage. NGA enables that accuracy. So, "Team NGA" includes many of the world's most accomplished, skilled, and experienced cartographers and geologists who work with scientific data about our planet, to make sure all our geolocational services are as good as they can be.

Other things NGA does include defining mean sea level through gravity, and being part of the World Geodetic System, which defines latitude and longitude – in other words, the contextual operating system of our planet. There's a huge military importance to this as well. We need to be on the same sheet of music as our Allies for all coalition operations.
You all know that GPS started in the Defense Department. Each time you use GPS to navigate, more that 60% of the data comes from NGA. We don't actually make GPS, but we do make sure it's accurate.

And the bottom line is: anyone who sails a ship, flies an aircraft, goes into harm's way, makes national policy decisions, responds to disasters, or navigates with a cellphone, all rely on NGA. We consume, document, deconflict, and track data about the earth, to organize the disorder, to bring coherence from chaos. We can do that for one simple reason: the power of geolocation.

Everything on this earth happens at some time, and in some place; the process of geolocation identifies precisely where that is. And every local, regional, and global challenge – national security, climate change, energy resources, urbanization, etc. – has geolocation at its heart.

Now, the main way we get to absolutely "Know the Earth" is via satellite imagery. Well, this capability has grown over time. We've had a long, historic mission partnership with the National Reconnaissance Office that launches classified satellites into space, and that partnership will continue to be our foundation of exquisite value to our customers. But we also have commercial partners, and there are more opportunities ahead in that arena. There's an explosion in the commercial imagery and open content world.

Geospatial data streaming from hundreds of overhead platforms covering the earth multiple times a day is about to happen in the very near future. So the challenges of taking advantage of all that data are

daunting, and the opportunities are momentous. The increased global coverage these sources will provide is going to be a key enabler for GEOINT.

Let's go back to my agency's vision, and look at the second part: "Show the Way." That refers to how we convey our analysis to our customers, how we make sure there's proper context to the information we provide. And one of our big challenges is creating unique value in this suddenly congested, competitive, and open world.

One thing about my agency you might find surprising is it's vitally important that we're able to succeed in the open – and with the open – not just the classified world. Within the next few years, many this year, the small commercial satellites I mentioned will continuously image the earth. Because private companies – some large, some small – are all set to launch literally hundreds of them. Some so small and light, you could hold one in your hand.

So we're about to enter a brand new space age, the likes of which the world has never seen; and because of it, the planet itself will be more visible than ever in history. Imagine the Earth, seen as millions of daily one-meter slices, with common access by everyone to that imagery. So we have to leverage the unclassified community far more than we ever have before as an intelligence agency. It means that we have to understand the world of social media, and how our adversaries are working to exploit it. It means that we have to work with many more partners, not only other intelligence agencies, but unclassified, non-governmental partners, as well. We have to succeed in the open, so we can gather, assess and document information to:

- Detect patterns of behavior,
- Interpret those behaviors,
- Create insight and understanding from the tsunami of data that's available,
- And advantage those who depend on us.

So we welcome and embrace all new information sources.

We have momentum in this area – we recently launched a project called the GEOINT Pathfinder. It's our most recent initiative to gather geospatial intelligence data out in the open, from data sources that everyone can deal with, every day. They worked from unclassified off-site facilities to see if they can be successful without all the classified tricks of the trade. The group is made up of data scientists, application developers, open source researchers, methodologists, analysts, and foreign partners. They've done 90-day sprints to answer intelligence questions using only that open source data and commercial information technology.

This is a big deal for people who've mostly worked in secure government facilities. And the results have been great so far. We have discovered innovative applications and helped uncover useful intelligence in the open.

Another example of NGA working in the open relates to the Ebola crisis in West Africa. We helped place treatment units, and figured out travel times and routes from places where Ebola breakouts occurred. It was all posted on the worldwide web. No special accounts or passwords were required, just a browser.

Doing that allowed health care workers to isolate those with the virus faster, and shorten the time between diagnosis and treatment. Saving time led to saving lives. And by the way, last Tuesday, the UN's World Health Organisation declared Ebola eradicated in Guinea. That shows real consequence. And we have a long history of supporting those in uniform. In this case, the uniforms weren't camouflaged, they were white lab coats.

We're also very involved in the Arctic, which is not a typical place most people think about when it comes to intelligence. Ours is not to explain why the ice is melting; rather, we owe the impact of that reduced ice coverage. There's increased operational use of the Arctic, so we want to make sure our customers have the most accurate data in such a harsh environment.

You may recall President Obama made a historic trip north of the Arctic Circle this last summer. He announced to the world that NGA and the National Science Foundation will team up to provide high resolution 3-D elevation maps of Alaska and the entire Arctic by 2017. The data will support activities like coastal zone management, fisheries management, and tourism.

We're also working with academic partners like the University of Minnesota's Polar Geospatial Center. Scientific endeavors in the Arctic and Antarctica rely heavily on our data and products, both classified and unclassified. Looking at the ice shift, you probably couldn't help but think of the Arctic as a big, melting, shrinking puzzle piece.

You can actually think about all intelligence analysis like an enormous puzzle. It can be complicated, but it's almost always solvable. And geospatial intelligence truly helps solve puzzles. Sometimes our analysts even find a critical piece of the puzzle before they have any idea what the actual puzzle is – or that there is a puzzle. But one piece tends to leads to another, and another, and another.

So we need to recruit, train, and retain analysts who can use spatio-temporal thinking to figure out puzzles, and maybe even turn the most complicated intelligence mysteries into solvable puzzles. And we need to apply innovative IT solutions to do the "what" – to free up our expert resources to worry about the "why."

What do I mean by "spatio-temporal thinking"? Simply, it's thinking in multiple dimensions, and that extends to both time and space. It's the ability to put together the myriad pieces of that jigsaw puzzle. But since every human activity changes through time and place, a human jigsaw puzzle constantly changes. Pieces move in and out, shapes of pieces themselves change, and the puzzle can spin around, or change dimensions.

Analysts have to evaluate these changes space and time to develop an accurate picture as a situation changes. And they need to evaluate a number of increasingly complex geographic variables, which in a moment, can turn into a crisis.

We can also see how the Internet of Things, or the Internet of Everything as I learned yesterday, has emerged with geolocation sensors in everything, from self-driven automobiles to our clothing. The importance of knowing the geolocation of everything is the bridge between commerce, cooperation, and security.

And who better to focus on that than geospatial analysts? Because they're natural integrators. They use geospatial data to analyze questions with scientific methods, and they end up with unique perspectives that are also grounded in reality.

Our goal is to turn chaos into coherence, to find the truth in that overload of data that analysts have to sift through. Our value proposition is that we bring this coherence to the decision maker. And beyond that coherence, we need to pursue and discover meaning.

Our analysts, and their supporting IT infrastructure, are now in the process of moving from seeing to sensing – from sensing to understanding – and from understanding to anticipating. The effect is going to be rich insight into how and why adversaries act, and even anticipation of how they can or might act, based on their behaviors, and the context in which they operate. This is the future, but it's close to the present, too.

That leads right back into my agency's vision, because the third and final section is to "Understand the World," to create coherence from chaos. This is why we do what we do. We exist for our customers, so that our customers do understand the world, and then succeed because they have a deeper understanding than anyone else does. It's also where we could use your help.

I was asked here primarily to speak about real-time analytics and the security of the United States. So let me explain why geospatial intelligence is so vital to our national policymakers and warfighters' understanding of the world.

My boss, the Director of National Intelligence Jim Clapper, says that our nation today faces the most diverse and most challenging threats of the past 50 years. I agree.

Those threats include terrorism, cyber security, weapons of mass destruction, space security, economic and natural resource issues, and basic human security. We face regional crises in the Middle East, Asia, Eastern Europe, and the Korean Peninsula. We also face the global challenges of climate change, violent natural and man-made disasters, disease pandemics, mass urbanization, international criminal networks, and refugee migration.

At NGA, we react to emerging crises in hours, if not in minutes. But what's even better is if we don't have to react to them at all. Because ideally, we anticipate them.

Basically, whenever you see a headline or hear a news report about an international crisis, or a domestic or international disaster, understand that my agency plays an important role to help our customers confront each and every one of those challenges. We're needed for many things, including to ensure that U.S. and coalition forces are correctly positioned, that their warplanes navigate safely, and that they hit their targets precisely.

What's new about how we do this? How have analytics changed in the national security arena?

Let me take you back to the beginning of my personal story. I first entered the Intelligence Community in the midst of the Cold War in the early 1980s, when the tools of the trade were light tables, a small

tube magnifier, paper files and a slide rule. I would peer through a microscope and study each pixel of a satellite photo.

My job back then was to build on little bits of information, stack one image against another, and identify some type of unusual or unexpected movement across time. At the time, it was a challenging job, but it was done mostly in solitude, looking for needles in haystacks. The needles were military equipment, and the haystacks were the Soviet Union and China. It really didn't require much interaction with anybody else; that was even discouraged. I felt like a lone hunter, stalking and hunting down elusive prey.

Now, we're all proud of our past, but we've had to change considerably with the times, because the world is a lot more complicated. After 9/11 and the reforms involving U.S. intelligence that followed, our community finally realized we needed to share our information with each other. So everything changed. And when Jim Clapper took over as DNI five and half years ago, he called for fully integrated intelligence, which hastened the pace for sharing even more.

Now, as we look to groom the next generation of intelligence professionals, we don't need lone hunters any more like I used to be. We need gatherers, we need collaborators, we need puzzle solvers, and we need you. It's better and faster to arrive at our understanding of current and potential threats by trending, predicting, forecasting and anticipating the threat. We have to expect the unexpected to happen anywhere, and every day. We can't just look at the two biggest haystacks. In fact, I don't want my humans to search haystacks – that's a waste of their valuable time. So we buy and rent an enormous amount of remote-sensing data.

We'll always have high performance government satellites for the hardest problems. But where we used to look at static images, now it's about dynamic ones; and that can come from any platform, any sensor, including commercial ones.

We used to know exactly what we were looking for. Now, in a much more complicated world, we don't necessarily.

Because we're not really looking for things anymore, we're looking for activity – changes in patterns that are hiding in the data.

The new frontier is in understanding activity. So the next horizon in our business to explore is activity analysis, and that's going to be made possible by the emergent power of analytics. It's not really a new concept; looking for activity has always been part of the intelligence mission. But what's different today is that the activity and timeframe can be analyzed with finer distinctions because of dramatic advances in sensors, and at a faster rate, because of increased computing capacity that enables real-time integration of large, diverse data streams.

So it's our new foundation for intelligence analysis. We're not looking for things, instead we're looking for activity, associations, and correlations. And while traditional intelligence analysts used to study events chronologically, now we look at events in a nonlinear fashion, so analysts evaluate the data across space and time. This is only the beginning; my profession is on the cusp of a transformation.

The sheer numbers of commercial satellites and satellite operators in the near future will exponentially increase the sensors that can be leveraged to do our job. At NGA, we're "all in" when it comes more sensors, more data, better integration, and more analytics. In both the government and commercial sectors, there's a tremendous amount of discussion about how to do this.

The questions we now need to think about are important. Will we buy derivative services instead of raw pixels from providers? Are the new satellite companies also the analytic providers, or will that be other companies, or us, or some combination?

One way or another, there will be new capabilities and partnerships that will challenge our concepts of integration in the business of creating GEOINT, and push the limits on innovation. The real-time analytics that follow will help analysts provide better and faster intelligence to our customers, and improve national security in a big way. I hope you can join us in our quest to "Know the Earth … Show the Way … and Understand the World."

For those interested, we've tried to minimize the red-tape and bureaucracy by setting up what we call our GEOINT Solutions Marketplace – or GSM for short – right on our main website, www.nga.mil.

It's a centralized, Cloud-based location to discover products, solutions, and potential partners. And it offers features like an immersive virtual sandbox, for mash-ups and product demonstrations. The website lets you showcase your products, to both us and to the larger GEOINT community.

By getting on there, you can gain some insight and knowledge into government needs and burning issues, too. We believe it's a lower barrier of entry into the government marketplace for new and small vendors.

It would be great to figure out how we can share our collective knowledge, to better protect our citizens from the myriad of threats out there. At NGA, we're proud to provide data and expertise in our field, but we acknowledge that industry also provides the technology for interaction and communication.
If you do go to our site, please also take a look at our "Commercial GEOINT Strategy" to learn more about our intention and our plan.

We've got some of the best people in the world, but where we can always use help is from experts in data, technology, and visualization. So I would embrace the opportunity to work with you. If you have a great idea, I'd very much like to hear from you.

We all recognize that everyone has access to much of the same technology these days. Which makes it even more important that we at NGA focus on advanced research, to build on, and lead, in our field. It's beneficial to do it with new partners, and I think most of you would enjoy becoming one of them.

And that is the reason why I'm here: to introduce my agency to you, to let you know how important the data we all use is to our nation's security, and let you know that we're open to meeting with you.

Yesterday, we heard from a Renaissance man, Skunk Baxter – a Hall of Fame rock guitarist, who's also a legendary consultant on defense issues, and a friend. I'd like to close with the words of another

great musician, Miles Davis. He once said: "You have to surround yourself with musicians who think, not ones who are comfortable." So let's all think outside our comfort zones.

And I'll finish by just saying that I really appreciate being here with you, at a conference where, despite our somewhat different backgrounds, we can all gather to think, instead of just being comfortable. Now, I'd love to take your questions, and turn this into a dialogue. I'd especially appreciate any suggestions on how we can make it even easier to work with us.

If we make it more possible to collaborate with the best minds in industry, we also make this country and our allies safer, and that's my ultimate goal.

Thanks very much.

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